Applicant : Marple, Jack W.
Serial No. : 10/719,425
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Art Unit: 1745
Examiner: Rhee, Jane J.

CLAIM AMENDMENTS

1. (original) An electrochemical battery cell comprising a housing; a negative electrode strip comprising metallic lithium, a positive electrode strip comprising an active material mixture and an electrolyte comprising at least one salt dissolved in a nonaqueous electrolyte disposed within the housing; and a separator disposed between the negative and positive electrodes; the cell having a ratio of a cathode interfacial capacity to an electrode assembly interfacial volume of at least 710 mAh/cm^3.

2. (original) The cell as defined in claim 1, wherein the electrode active material comprises greater than 50 weight percent iron disulfide.

3. (original) The cell as defined in claim 2, wherein the electrode active material comprises at least 95 weight percent iron disulfide.

4. (original) The cell as defined in claim 3, wherein the electrode active material comprises at least 99 weight percent iron disulfide.

5. (original) The cell as defined in claim 1, wherein the ratio of the cathode interfacial capacity to the electrode assembly interfacial volume is at least 720 mAh/cm^3.

6. (original) The cell as defined in claim 1, wherein:

(a) the housing comprises a container with a closed end, an initially open end closed by a cover, and a side wall extending between the closed and initially open ends;

(b) the negative electrode is in the form of at least one sheet with two opposing major surfaces;

(c) the positive electrode is in the form of at least one sheet with two opposing major surfaces; and

(d) the negative and positive electrodes are disposed within the container with a portion of at least one major surface of the negative electrode sheet adjacent a portion of at least one major surface of the positive electrode sheet through the separator, and at least some

segments of adjacent portions of the negative and positive electrodes are parallel to a longitudinal axis of the cell.

7. (original) The cell as defined in claim 6, wherein the negative and positive electrodes and the separator form a spiral wound electrode assembly.

8. (original) The cell as defined in claim 7, wherein the container has a cylindrical shape and the electrode assembly has a radial outer surface disposed adjacent an inner surface of the container side wall.

9. (original) The cell as defined in claim 7, wherein the container has a prismatic shape and the electrode assembly has an outer surface disposed adjacent an inner surface of the container side wall.

10. (original) The cell as defined in claim 1, wherein the separator is a microporous membrane and has a thickness less than 25 μm and a tensile stress of at least 1.0 kgf/cm in both a machine direction and a transverse direction.

11. (original) The cell as defined in claim 10, wherein the separator has a thickness less than 22 μm.

12. (original) The cell as defined in claim 10, wherein the tensile stress of the separator is at least 1.5 kgf/cm.

13. (original) The cell as defined in claim 12, wherein the tensile stress of the separator is at least 1.75 kgf/cm.

14. (original) The cell as defined in claim 10, wherein the separator has a dielectric breakdown voltage of at least 2000 volts.

15. The cell as defined in claim 14, wherein the dielectric breakdown voltage is at least 2200 volts.

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16. (original) The cell as defined in claim 15, wherein the dielectric breakdown voltage is at least 2400 volts.

17. (original) The cell as defined in claim 10, wherein the separator has a maximum effective pore size of from 0.08 μm to 0.40 μm.

18. (original) The cell as defined in claim 17, wherein the maximum effective pore size is no greater than 0.20 μm.

19. (original) The cell as defined in claim 10, wherein the microporous membrane comprises polyethylene.

20. (original) The cell as defined in claim 10, wherein the separator has a BET specific surface area of 4.0 to 15 m^2/g.

21. (original) An electrochemical battery cell comprising a housing; a negative electrode, a positive electrode and an electrolyte disposed within the housing; and a separator disposed between the negative and positive electrodes; wherein:

(a) the housing comprises a cylindrical container with an integral closed bottom end, an initially open top end, a side wall extending between the bottom and top ends and a cover disposed in the top end to close the cell;

(b) the negative electrode is in the form of a strip with two opposing major surfaces and comprises metallic lithium;

(c) the positive electrode is in the form of a strip with two opposing major surfaces and comprises an active material mixture, the active material comprising greater than 50 weight percent iron disulfide;

(d) the electrolyte comprises one or more salts dissolved in a nonaqueous organic solvent;

(e) the negative and positive electrodes and the separator form a spiral wound cylindrical electrode assembly, with a radial outer surface disposed adjacent an inner surface of the container side wall;

(f) the electrode assembly has an interfacial volume;

(g) the positive electrode has an interfacial capacity;

(h) a ratio of the positive electrode interfacial capacity to the electrode assembly interfacial volume is at least 710 mAh/cm^3; and

(h) the separator is a microporous membrane comprising polyethylene, with a machine direction and a transverse direction, an average thickness less than 22 μm and a tensile stress of at least 1.0 kgf/cm in both the machine direction and the transverse direction.

22. (original) The cell as defined in claim 21, wherein the active material comprises at least 95 weight percent iron disulfide.

23. (original) The cell as defined in claim 22, wherein the active material comprises at least 99 weight percent iron disulfide.

24. (original) The cell as defined in claim 21, wherein the tensile stress of the separator is at least 1200 kgf/cm^2 in both the machine direction and the transverse direction.

25. (original) The cell as defined in claim 21, wherein the ratio of the cathode interfacial capacity to the electrode assembly interfacial volume is at least 720 mAh/cm^3.

26. (original) The cell as defined in claim 21, wherein the separator has a dielectric breakdown voltage of at least 2200 volts.

27. (currently amended) An electrochemical battery cell comprising a housing; a negative electrode, a positive electrode and an electrolyte disposed within the housing; and a separator disposed between the negative and positive electrodes; wherein:

(a) the cell is a cylindrical FR6 type Li/FeS_2 cell with a spiral wound electrode assembly having an electrode assembly interfacial volume;

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(b) the cell has an interfacial capacity of at least 3500 mAh;

(c) the separator is a microporous membrane comprising polyethylene and has an average thickness less than 22 μm, a tensile stress of at least 2.0 kgf/cm in both a machine direction and a transverse direction, a dielectric breakdown voltage of at least 2400 volts, a maximum effective pore size of 0.08 μm to 0.20 μm and a BET specific surface area of 4.0 to 15 m^2/g; and

the cell has a ratio of the cathode interfacial capacity to the electrode assembly interfacial volume of at least 710 mAh/cm^3.

28. (cancelled)

29. (currently amended) An electrochemical battery cell comprising a housing; a negative electrode, a positive electrode and an electrolyte disposed within the housing; and a separator disposed between the negative and positive electrodes; wherein:

(a) the cell is a cylindrical FR6 type Li/FeS_2 cell with a spiral wound electrode assembly having an electrode assembly interfacial volume;

(b) the separator is a microporous membrane comprising polyethylene and has an average thickness less than 22 μm, a tensile stress of at least 2.0 in both a machine direction and a transverse direction, a dielectric breakdown voltage of at least 2400 volts and a maximum effective pore size of 0.08 μm to 0.20 μm;

(c) the positive electrode comprises an active material comprising at least 95 weight percent iron disulfide; ~~and~~

(d) the cell has a ratio of the cathode interfacial capacity to the electrode assembly interfacial volume of at least 710 mAh/cm^3; and

(e) the cell is capable of providing a discharge capacity of at least 2950 mAh when discharged at 200 mA continuously to 1.0 volt and a discharge capacity of at least 2600 mAh when discharged at 1000 mA continuously to 1.0 volt.